MYANMAR BOARD OF ENGINEERS

PROFESSIONAL ENGINEER
(PE)

REGISTRATION REQUIREMENTS

OCTOBER 2012
ASEAN VISION နှင့် အတူ အတွင်းအပြောင်း ရရှိမှုသည် အာက်ပျော်ရွှင်မှု အထောက်အပွဲ ASEAN ECONOMIC COMMUNITY (AEC) ကို လှုပ်ရှားနိုင်မည်ဖြစ်သော အတွင်းအပြောင်းများကို အဆင့်များစွာ ဖော်ပြထား၍ အမျိုးမျိုး ပြောင်းလဲမှုများကို ဖျင်ပွားဦးစွာ ပြည့်မှုဖြင့် စစ်ဆေးမှ ပြည့်မှု Mutual Recognition Arrangement on Engineering Service (MRA on Engineering Service) ကို အတည်ပြုထားသည် အတွေးအမြင့် အသိပေးချက် အတွက် များကို Professional Engineer (PE) များအဖွဲ့အစည်းအဖွဲ့ အတွက် ဖြန်မှားမှုများကို ဖော်ပြထား၏

Professional Engineer များအဖွဲ့အစည်းများ၏ ရရှိမှုတော်မူသော်လည်း မူလအနက်အထိ ဆက်စပ်မှု အများကျန်စွာ လှုပ်ရှားထားသည် PE များကို ပြည်သူ့အဖွဲ့အစည်း PE များ ကို ဖော်ပြထားသည် အဖွဲ့အစည်းအဖွဲ့ ပြည်သူ့အဖွဲ့အစည်းအဖွဲ့

1. အချက်အလက်တို့အပြိုင် (Public Safety)
2. အချက်အလက်အပြိုင် (Mobility)
3. အဆောက်အအုံများသင်တန်းမှု (Professional Development)
4. အမြင့် (Recognition)

မောင်လှိုင်မှူး PE ကို များ တိုးတက်အမှုများကို မြန်မာ工程师协会 (Myanmar Board of Engineers) ကို အတည်ပြုထားသည် PE ကို များတိုးတက်အမှုများ ကြည့်ရှန်းကာ ထိန်းသိမ်းသည်

အထောက်အပွဲ PE များ တိုးတက်အမှုများကို အလုပ်လုပ်သည် အဖွဲ့အစည်း ဖော်ပြထားသည် PE များ တိုးတက်အမှုများ ကြည့်ရှန်းကာ ထိန်းသိမ်းသည်

Myanmar Board of Engineers
Professional Engineer (PE) အမွေများကို လေ့လာရာတွင် အဆင့်မှာ ရှိသည်။

(၁) Professional Development Program (PDP) အဆင့်မှာ ရှိသည်။

(၂) Continuing Professional Development (CPD) အဆင့်မှာ ရှိသည်။

Professional Development Program (PDP)

Professional Development Program (PDP) အဆင့်မှာ ရှိသည်။

(၁) Engineering Management

(၂) Safety

(၃) Ethics

(၄) Fundamentals of Engineering

(၅) Rules, Regulations, Standards and Specification

(၆) Professional Topics


Continuing Professional Development (CPD)

Continuing Professional Development (CPD) အပေါ် Professional Engineer ရှိသည်။
CPD ကို အတည်ပြုရန် အဘယ်ကြောင်း စိတ်ကူးချင်သော ဗိုလ်ချုပ်

- Formal Education and Training Activities
- Informal Learning Activities – on job learning
- Informal Learning Activities – private study
- Conference and Meeting
- Presentation and Papers
- Service Activities
- Industry Involvement (for academician)

Professional Assessment

- Professional Assessment Written Examination
- Professional Experiences and Competency Report
- Professional Presentation on Projects and Achievements.
- Professional Interview

Professional Assessment Written Examination အတွက် အလုပ်ပြုပြီး အခြေခံချက်များ အစီအစီ လုပ်ဆောင်ခြင်း အဖြစ် အလွန်အကြား အခြေခံ နှင့် ပေါင်းစည်းပြီး ကိုယ်စားပြုပြီး နောက်ပိုင်း အလုပ်ပြုပြီး Professional Assessment Group (PAG)

Professional Assessment Written Examination (PAWE) - PAWE အတွက် အလုပ်ပြုပြီး အခြေခံချက်များ လုပ်ဆောင်ခြင်း အဖြစ် အလွန်အကြား အခြေခံ နှင့် ပေါင်းစည်းပြီး ကိုယ်စားပြုပြီး နောက်ပိုင်း အလုပ်ပြုပြီး Professional Assessment Group (PAG)
Professional Experiences and Competency Report (PECR)

PECR ပေါင် Professional Engineer ခရီးသားများအားလုံးကို အကောင်အထည်များ အခြေခံပါ Professional Competency ၁၃ဦးစီမံချစ်ရာမှာ့အကောင်အထည်များ အကောင်အထည်ပါ Competency Report ထွက်လာပါသည်

(1) Apply Engineering Knowledge, Methods and Techniques.
(2) Use of engineering technology, tools and equipment
(3) Safeguard public safety
(4) Recognize the impacts of engineering on the environment, economy and society
(5) Manage engineering activities
(6) Communicate engineering information
(7) Work Collaboratively
(8) Maintain and enhance engineering skills and knowledge

Professional Experience and Competency Report ပထမ့်စွာ နေထိုင်ချက်များကို အကောင်အထည်ပါ Professional Experience စံပိုးချင်းအဖြစ် ကြားနေပါသည် Professional Engineer အဖြစ် Professional Experience အဖြစ် Professional Experience စံပိုးချင်းပြုပြင်ပါသည်

Professional Experiences and Competency Report အဖြစ် Professional Experience အဖြစ် Format ကို စီစဉ်ပါ Professional Experience အဖြစ် Introduction ပြင်ကြားပါ

Section (1) Introduction
Section (2) Work experiences in brief and highlight the major important projects.
Section (3-10) Using each Competence Element / Performance Indicators as heading, describe the problems and activities that you have addressed or been involved in to demonstrate your attainments under each heading.
Professional Presentation on Projects and Achievements (PPPA) - ပရောဂျင်ဒီမိုကရက်တစ်ပွဲ]

Professional Engineers ရေးသားသောဝေါဟာရများနှင့် ပန်းနာဂရိုးတော်ရုက္ခဗေဒနှင့်ကူးစက်မှုများ ပေးထားပြီး နောက်ပိုင်း လုပ်ငန်းများ Report တွေကို တင်ပို့ပါသည်။ အနေဖြင့် Professional Assessment Written Examination အချက် စိတ်ချောက်နေသော အရာတွေကို နောက်ပိုင်း လုပ်ငန်းများ Professional Interview (PI) အဖြင့် ပြောင်းလိုက်တာကြောင်း Professional Engineer System အဖြင့် စိတ်ချောက်နေသော အရာတွေကို ဖျင်စွာနေလိုက်တာကြောင်း Professional Engineers ရေးသားသောဝေါဟာရများကို ပေးထားပြီး တင်ပို့ပါသည်။
## MYANMAR BOARD OF ENGINEERS

### Professional Engineer Assessment (2012)

#### Sr No. | Requirements for PE Registration | PDP Hours requirements and other requirements | Experiences
| | | 7 years to 10 Years | 10 years | 15 years | 20 years |
| | | Less than | before 2005 | before 2002 | before 1997 | before 1992 |
| B.E Graduation Year | | | | | |
| A | Professional Development Program (PDP) | | | | |
| | Total PDP Hr Requirement | 40 | 30 | 20 | 15 |

#### 1. Engineering Management
- 6
- 4
- 4
- 2

#### 2. Safety
- 6
- 4
- 4
- 2

#### 3. Ethics
- 4
- 2
- 2
- 2

#### 4. Fundamentals of Engineering
- 8
- 8
- 4
- 3

#### 5. Acts, Rules and Regulations
- 4
- 4
- 4
- 4

#### 6. Topics related to Engineering Discipline
- 12
- 8
- 2
- 2

#### 7. Report on understanding of the above topics
- Report
- Report

#### 8. Examination on above topics
- Exam
- Exam

#### B. Continuing Professional Development

##### 1. Report on CPD activities of last three years (Average hrs. per year)
- 30
- 30
- 25
- 20

#### C. Professional Assessment

##### 1. Report on Professional Experiences & Competency
- Report
- Report
- Report
- Report

##### 2. Examination on Professional Topics
- Exam
- Exam

##### 3. Professional Interview
- PI
- PI
- PI
- PI

##### 4. Presentation on Professional Experiences
- Presentation
- Presentation
- Presentation
- Presentation

##### 5. Discussion, comment and question on Presentation
- DCQ
- DCQ
- DCQ
- DCQ
### MYANMAR BOARD OF ENGINEERS

#### PROFESSIONAL DEVELOPMENT PROGRAMS

#### PDP RECORD SHEET

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<th>Date/Time</th>
<th>Topic</th>
<th>Provider</th>
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**Total PDP Hours**

1. Engineering Management (EM)  
2. Safety  
3. Ethics  
4. Fundamentals of Engineering (FE)  
5. Acts, Rules & Regulations  
6. Professional Topics (PT)  

**Submitted By**

Signature
Name
Address
Email
Phone No
# MYANMAR BOARD OF ENGINEERS

**CONTINUING PROFESSIONAL DEVELOPMENT FOR PROFESSIONAL ENGINEERS**

**CPD RECORD SHEET No. 1**

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1. Formal Education and Training Activities (time weighted factor = 2)
   - 1
   - 2
   - 3
   - 4
   - 5
   - 6
   - 7
   - 8
   - 9
   - 10

Total Weighted Hours = 

Total Allowable Weighted Hours (No limit) =

2a. Informal Learning Activities – on job learning (time weighted factors = 1)
   - 1
   - 2
   - 3
   - 4
   - 5
   - 6
   - 7
   - 8
   - 9
   - 10

Total Weighted Hours = 

Total Allowable Weighted Hours (Maximum 20 hours per year) =

2b. Informal Learning Activities – private study (time weighted factors = 0.5)
   - 1
   - 2
   - 3
   - 4
   - 5
   - 6
   - 7
   - 8
   - 9
   - 10

Total Weighted Hours = 

Total Allowable Weighted Hours (Maximum 10 hours per year) =
### MYANMAR BOARD OF ENGINEERS
### CONTINUING PROFESSIONAL DEVELOPMENT FOR PROFESSIONAL ENGINEERS
### CPD RECORD SHEET No.2

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### MYANMAR BOARD OF ENGINEERS

CONTINUING PROFESSIONAL DEVELOPMENT FOR PROFESSIONAL ENGINEERS

**CPD RECORD SHEET No.3**

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Total Allowable Weighted Hours (Maximum 30 hours) =

Every applicant for Professional Engineer must submit his CPD records to Myanmar Board of Engineers. The Board will make random check on the submission.

Average CPD hours must not be less than 20/25/30 per year over a three year period, according to experiences.

**ALLOWABLE WEIGHTED CPD HOURS WILL BE FILLED BY MBE**

**CPD RECORD SHEET SUBMITTED BY**

SIGNATURE: ____________________________

NAME: ________________________________

NATIONAL REGISTRATION NO: __________

ADDRESS: ____________________________

EMAIL: ______________________________

PHONE: ______________________________

DATE: ________________________________
Scope (Building Construction PE)

(A) Earthwork Construction & Layout
- Excavation & Layout (cut & fill)
- Borrow pit volumes
- Site layout & control

(B) Estimating Quantities & Costs
- Builder's estimate & Builder's quantity
- Cost Estimating
- Cost Controlling

(C) Scheduling
- Construction sequencing
- Resource scheduling
- Paragraph & CPM analysis
- Engineering management

(D) Design & Drawings
- Basic design principles
- Shop drawings

(E) Materials Quality Control & Production
- Materials specifications & testings (Cement, Coarse and fine aggregate, Water, Construction chemicals, Structural steel, Timber etc.)
- Welding & bolting testing
- Quality control process (QA/ QC)
- Concrete (Plain, Reinforced, Prestressed, Post tensioned, Fiber reinforced concrete, Ferrocement, High performance concrete, Light weight concrete)
- Concrete mix design
- Concrete maturity & early strength evaluation

(F) Temporary Structures
- Construction Load
- Formwork
- False work & Scaffolding
- Shoring & reshoring
- Bracing
- Anchorage
Geotechnical & Foundation Engineering
- Types of foundation
- Soil classification
- Boring log interpretation (e.g. soil profile etc.)
- Pressure distribution
- Lateral earth pressure
- Consolidation
- Compaction
- Slope Stability
- Slabs on grade
- Bearing Capacity
- Settlement
- Retaining Walls (gravity walls, RC walls, cantilever walls etc.)
- Braced & anchored excavation

Structural Engineering
- Loadings (dead loads, live loads, E.Q Loads, wind loads, snow loads, construction loads, load paths, etc.)
- Shear force diagram
- Bending moment diagram
- Flexure, Shear, Tension, Compression, Torsion
- Combined stresses
- Deflection

Construction Equipment
- Design of equipment fleet operation & productivity
- Design of rigging & conveying system

Safe Demolition System for Constructed Facilities

Engineering Ethics

Occupational Safety and Health

Code of Practice, Rules & Regulations

Computer Skill
(Building Construction PE)

REFERENCES

1. Handbook of Rigging by Joseph A. MacDonald
2. Construction Management (CM 188)
3. Construction Methods and Planning by J.R. ILLINGWORTH
4. All in one civil Engineering PE. Breadth and Depth
Scope (Road PE)

Road

(1) Basic Principles of Road Design.
   (a) Road Geometric Design.
      (1) Flexible pavements.
      (2) Rigid pavements.

(2) Road Structures Design.
   (1) Flexible pavements.
   (2) Rigid pavements.

(3) Standard Technical Specifications for road constructions.


(5) Road Maintenance Manual.

(6) Rules, Regulations and Acts.
   - Road acts.
   - Toll road acts.
   - Road maintenance fund act.
   - Road safety regulations.

(7) Pavement Condition Assessment.
   - Surface evaluation and rating.
   - Ride quality assessment.
   - Multi-year budgeting for pavement rehabilitations and reconstructions.
   - Priority selecting and financing for maintenance works.

(8) Construction.
   (a) Earth works.
      - Requirements for excavation of cutting.
      - Requirements for embankment.
      - Requirements for embankment construction.
      - Borrow excavation and compaction for subgrades.
      - Mechanical and chemical stabilizations.

   (b) Sub-base and Base.
      - Granular base.
      - Gravel/ soil aggregate base and surface courses.
      - Cement treated soil and crushed stone subbase and base.
      - Graded crushed stone subbase and base.
      - Water bound macadam subbase and base.
      - Dry bound macadam subbase and base.
(c) Surface courses.
   - Bituminous macadam (penetration method) surface course.
   - Asphalt concrete pavement.
   - Bituminous premix surface course.
   - Cold mixed asphalt.
   - Portlant cement concrete pavement (plain and reinforced).
   - Roller compacted concrete pavement.
   - Recycling of pavement.
(d) Drain and Drainage system.
(e) Road Signs and Safety measure.
   - Road furniture.
   - Road safety audit.
   - Road signs, Road markings, signals.
   - Improvement hazardous location (Black spot).
(f) Environment impact.

(9) Maintenance Works.
   - Gravel roads.
   - Bituminous pavements.
   - Asphalt concrete pavements.
   - Concrete pavements.
   - Drains and drainage structures.
   - Road signs and safety measures.

(10) Quality Control and Quality Assurance.

(11) Ethics.

(12) Occupational Safety and Health.

(13) Engineering Management.
REFERENCES

1. All in one civil engineering PE (Exam Guide)
   Breadth and Depth
   by Indranil Goswami, Ph.D, PE, McGraw Hill

2. Basic Principles of Highway Design
   (a) "AASHTO Guide for Design of Pavement Structures: 1993". Published by AASHTO.
   (c) Implementation of the AASHTO Pavement Design Procedures into Multi-pave” by Abiy Bekele, Division of Highway and Railway Engineering, Department of Civil and Architectural Engineering, Royal Institute of Technology, Stockholm 2011.
   (d) “Pavement Design Manual, Supplement to Part 2: Pavement Structural Design” of Austroads” issued by Queens land Department of Main Roads.
   (e) Mechanistic - Empirical Pavement Design Guide Implementation” submitted to the South Carolina Department of Transporation and the Federal Highway Administration.
   (f) “Concrete Pavement Design, Construction and Performance” by Norbert Delatta.
   (g) ကျောက်သို့သော ကြီးမားနောက်ပြည်သူဟု ကျောက်သို့သော ကြီးမားနောက်ပြည်သူဟု

3. Road Geometrical Standards
   (a) Geometric Design Standard (ကျောက်သို့သော ကြီးမားနောက်ပြည်သူဟု)
   (b) Road Note 31 - Transport + Road Research Laboratory UK.
   (c) Washington State Department of Transport Design Manual
   (d) A policy on Highway Geometric Design AASHTO.

4. Standard Technical Specifications for Road Construction
   (a) Standard Specifications for construction of Roads and Bridges on federal Highway projects: F P-96, 1996 by US DOT, FHA.
   (b) “Standard Technical Specifications for Roads, Bridge and Municipal Construction 2010:M41-10” by Washington State DOT-
   (c) “Standard Technical Specifications for Road and Bridge Works” of Public Works”, Ministry of Construction: May 2012.

5. Standard Specification for Road Maintenance
   - “Maintenance Standards for Road and Bridge works” of Public Works, Ministry of Construction, February 2012.
Scope (Structure PE)

(A) Strength of Materials.
   - Sign Convention for Stresses.
   - Centroid of an Area by Integration.
   - Centroid of a Compound Area_Weighted Average.
   - Various Section Properties.
   - Bending Stress.
   - Combined Axial and Bending Stress.
   - Shear Stress Due to Transverse Load.
   - Shear Stress Due to Torsion_Circular Sections.
   - Shear Stress Due to Torsion_Rectangular Sections.
   - Shear Stress Due to Torsion_Thin-Walled Sections.
   - Stress in Pressure Vessels.
     - Thin-Walled Pressure Vessel.
   - Moh's Circle: Normal ( ) and Shear Stress ( ) Combination

(B) Statically Determinate Structures
   - Vectors
   - Dot Product
   - Cross Product
   - Equivalent Force System
   - Analysis of Trusses
   - Truss Member Forces-Method of Joints
   - Truss Member Forces-Method of Sections
   - Identification of Zero-Force Members
   - Truss Deflection-Method of Virtual Work
   - Cables under Point Loads
   - Cables under Uniformly Distributed Load
     - Load Distributed Uniformly along Horizontal Axis
       (e.g., Bridge Deck)
     - Load Distributed Uniformly along Cable Length
       (e.g., Self Weight)
   - Shear Force and Bending Moment
   - Beam Deflection-the Elastic Curve
   - Direct Integration Method
   - Moment-Area Method
   - Conjugate Beam Method
- Unit Load Method
- Beam Deflection Equations
- Influence Lines
  - Principle of Müller-Breslau
  - Influence Line for Vertical Reaction at A
  - Influence Line for Reaction Moment at A
  - Influence Line for Shear at C
  - Influence Line for Bending Moment at C
- Shear at Midspan of Uniformly Loaded Beams
- Influence of a Series of Concentrated Loads
  - Absolute Maximum Shear
  - Absolute Maximum Bending Moment
- Calculating Effect of Concentrated and Distributed Loads

(C) Introduction to Indeterminate Structures
- Stability and Determinacy
- Determinate versus Indeterminate Structures
- The General Force Method
- Force Method Illustration
- Castigliano's Method
  - Castigliano's Second Theorem
- Castigliano's Method Applied to Trusses
- Castigliano's Method Applied to Beams
- Displacement Method
- Moment-Distribution Method
- The Slope-Deflection Method
- Using Results from Moment-Distribution or Slope-Deflection Methods
- Fixed-End Moments

(D) Concrete Fundamentals
- Absolute Volume Method
- ACI Provisions
- Reinforcement
- Strength Design Approach
- Load Combinations (ASCE-7)

(E) Reinforced Concrete Beams
- General
- Design Moments at Critical Locations.
- Cracked Section Characteristics.
  - Effective Moment of Inertia.
  - Clear Cover Guidelines.
- ACI Limits on Flexural Reinforcement.
- Spacing Guidelines
- Flexural Capacity of Singly Reinforced Concrete Beams.
- Design Problems.
- Doubly Reinforced Rectangular Section.
  - Compression Steel Yielded.
- Singly Reinforced T-Beams.
  - Effective Flange Width.
  - Flexural Capacity of Singly Reinforced T-Beams.
  - Rectangular Beam Behavior.
  - True T-Beam Behavior.
- Design of Reinforced Concrete Beams for Shear.
- Shear at Midspan of Uniformly Loaded Beams.

(F) Reinforced Concrete Slabs.
  - General.
  - One-Way Reinforced Concrete Slabs.
  - Minimum Slab Thickness.
  - Temperature and Shrinkage Reinforcement.
  - Two-Way Reinforced Concrete Slabs.
    - Total Static Moment in Slab Panel.

(G) Reinforced Concrete Columns
  - Guidelines on Longitudinal Reinforcement.
  - Short versus Long Columns.
  - Axial Load Capacity of Short RC Columns.
  - Column Interaction Diagrams.
  - Long Columns
    - Concentrically Loaded Long Columns (e=0)
    - Eccentrically Loaded Columns in Nonway Frames.
    - Eccentrically Loaded Columns in Sway Frames.

(H) Steel Tension Members.
  - Load and Resistance Factor Design (LRFD)
- Analysis and Design of Tension Members.
- Nominal Strength.
- Net Area in Tension.
- Net Area for Staggered Bolt Lines.
- Effective Net Area.
  - Shear Lag Coefficient.
- Aisle Load Tables.
- Block Shear.
- Pin-Connected Tension Members.

(I) Steel Compression Members.
- Stability of Axially Loaded Columns _Euler Buckling_.
- Critical Buckling Stress for Steel Columns.
  - Elastic Buckling.
  - Inelastic Buckling.
- Braced Columns.
- Effective Length for Columns in a Frame.
- Column with Slender Elements.
  - Elastic Buckling.
  - Inelastic Buckling.
- Single-Angle Compression Elements.
- Built-Up Compression Members.

(J) Steel Beams Design for Flexure.
- General Flexure Theory.
- Progressive Increase of Flexural Stresses.
- Elastic Section Modulus.
- Plastic Section Modulus.
- Design of Steel Beams _AISC Specifications_.
  - Nominal Moment Capacity.
  - Failure by Reaching Fully Plastic State.
  - Inelastic Lateral Torsional Buckling (LTB).
  - Elastic Lateral Torsional Buckling (LTB).
- Bending Coefficient $C_b$
- Beam Design Using $Z_x$ Tables.
- Beam Design Using Charts.
- Compactness Criteria.
- Flexural Strength of Noncompact Sections.
  - Flange Local Buckling (FLB)
  - Lateral Torsional Buckling (LTB)
- Design for Shear.
- Floor Framing Systems.

(K) Bolted and Welded Connections.
  - General
  - Snug-Tight versus Slip-Critical Connections
  - Bearing Type Connections
    - Bearing Strength of Bolts.
    - Shear Strength of Bolts.
  - Slip-Critical Connections.
  - Bolt Group Subject to Shear and Torsion.
  - Bolts Subject to Shear and Tension.
  - Fillet-Welded Joints.
  - Fillet Weld Features.
  - Strength of a Fillet Weld.
  - Second Moments of Weld Runs.

(L) Timber Design
  - Bending Stress.
  - Shear Stress.
  - Modulus of Elasticity.
  - Stress Modification Factors.
  - Design of Timber Columns.
    - Buckling Limit State.
    - Crushing Limit State.
    - Ylinen Column Equation.
  - Section Properties of Beams and Joists.
  - Section Properties of Planks.
  - Section Properties of Decking.
Reference Textbook

1. ALL-IN-ONE Civil Engineering P.E. Breadth and Depth-Exam Guide, INDRANIL GOSWAMI
4. Building Code Requirements for Structural Concrete - ACI-318
5. ASCE - Minimum Design Loads for Buildings and other Structures - ASCE 07
SCOPE (Geotechnical PE)

(A) Phase Relationships for Soils
   - Soil as a Three-Phase System.
   - Fundamental Definitions.
   - Shrinkage and Swell.

(B) Soil Sampling and Testing.
   - Guidelines for Subsurface Sampling
     - Structure Foundation.
     - Retaining Structures.
     - Ground Water
     - Interpretation of Boring Logs.
     - Effective Stress.
     - Soil Consistency.
     - Atterberg Limit Tests.
       - Liquid Limit Test (ASTM D-4318)
       - Plastic Limit Test (ASTM D-4318)
     - Standard Penetration Test (SPT)
     - Corrections to Field N Value.
     - Correlation between N Value and Bearing Capacity.
     - Relative Density.
     - Direct Shear Test.
     - Unconfined Compression Test.
     - Compaction.
     - Triaxial Test Fundamentals.

(C) Soil Classification
   - Sieve Sizes.
   - USDA Textural Classification of Soils
   - Particle Size Distribution Curves
   - Hydrometer Analysis
   - Unified Soil Classification System (USCS)
   - AASHTO Soil Classification
     Less Than or Equal to 35% Passing No.200
     Sieve - Predominantly Granular
     More Than 35% Passing No. 200 Sieve - Predominantly
     Fine Grain
   - Group Index (GI)
(D) Vertical Stress Increase at Depth
  - Approximate Methods
  - Boussinesq Model for Stress under Uniformly Loaded Area
  - Newmark's Chart for Graphical solution of Boussinesq's Equation
  - Boussinesq's Equation
  Stress Increase Due to a point Load
  - Boussinesq's Theory
  - Westergaard's Theory
  Stress Increase Due to a Line Load
  Stress Increase Due to a Strip Load
  Stress Increase Due to Uniformly Loaded Circular Footing
  Load on Buried Pipes
  - Deflection of Flexible Pipes
  - Modified Iowa Equation
  - Minimum Burial Depth
  Loads on Rigid Pipes
  - Indirect Design Method
  - Load Factor
  - Direct Design Method

(E) Flow through Porous Media
  - Groundwater Distribution
  - Darcy's Law for Seepage
  - Hydraulic Conductivity
  - Laboratory Measurement of Hydraulic Conductivity
    - Constant Head Test
    - Falling Head Test
  - Equivalent Hydraulic Conductivity (Layered Soils)
    - Flow Parallel to Soil Layers
    - Flow Transverse to Soil Layers
  - Field Measurement of Hydraulic Conductivity
  - Flow Nets
  - Calculation of Seepage Flow from Flow Nets
  - Anisotropic Soils
  - Uplift Pressure under Hydraulic Structures
  - Expansive Soils
  - Gravity Dams
  - Aquifers
  - Unsteady Well Hydraulics_Theis Method
    - Assumptions for Transient Drawdown Effects
  - Groundwater Dewatering.
Shallow Foundations
- General
  - Ultimate Bearing Capacity
    - Terzaghi's Bearing Capacity
    - Local Shear Failure
    - General Bearing Capacity Equation
- Shape Correction Factors
- Depth Correction Factors
  For \( D/D < 1 \)
  For \( D/D > 1 \)
- Load Inclination Correction Factors
- Factor of Safety for Bearing Capacity
- Local Shear Failure
- Dynamic Loads
- Allowable Bearing Pressure in Sand Based on Settlement
- Effect of Water Table on Bearing Capacity
- Coefficient of Subgrade Reaction
  - Plate Load Test
  - For Sandy Soils
  - For Clays
- Combined Footing
- Combined Footing-Design
- Mat Foundations
- Differential Settlement of Mats
- Compensated Foundations.
- Strap Footing ___Design
- Eccentric Load on a Shallow Footing
- Shear in Footings ___ One_Way and Two_Way Shear
- Elastic Settlement under Shallow Foundations

Deep Foundations
- Site Conditions
- Pile Types
- Pile Classification
- Point Bearing Capacity
  - Point Bearing Capacity for Piles in Sand
  - Point Bearing Capacity for Piles in Clay
  - Point Bearing Capacity for Piles Resting on a Rock Layer.
- Side Friction Capacity.
- Skin Friction Coefficient.
- Lateral Earth Pressure Coefficient
- Capacity of Pile Groups
- Special Considerations for Steel H-Section Piles
  - H Piles in Sand
  - H Piles in Soft Clay.
  - H Piles in Stiff Clay.
- Pile Groups Subject to Overturning Moment.
- Batter Piles
- Laterally Loaded Long Piles.
- Pullout Resistance
- Negative Skin Friction
- Settlement of Piles
  - Elastic Settlement
  - Settlement Due to Tip Load
  - Settlement Due to Shaft Load
- Elastic Settlement of Pile Groups
- Consolidation Settlement of Pile Groups
- Pile-Driving Formula

(H) Retaining Walls
- Lateral Earth Pressure.
- Wall Movement Necessary to Develop Lateral Pressures.
- Stability and Strength Checks.
- Active Earth Pressure
- Passive Earth Pressure
- Rankine's Theory for Earth Pressure.
- Suitability Number.
- Steps for Evaluating Stability of a Retaining Wall.
- Retaining Wall with Key.
- Horizontal Pressure on Retaining Walls Due to Surface Loads.
  - Point Load on Surface.
  - Line Load on Surface.
- Mechanically Stabilized Earth (MSE) Walls

(I) Support of Excavation
- Types of Excavation
- Modes of Failure
- Stabilization
- Bottom Heave in a Cut in Clay.
- Typical Plan and Elevation of a Braced Excavation
- Equivalent Pressure Diagrams for Braced Cuts.
  - Sand
  - Soft to Medium Clay
  - Stiff Clay
- Design of Sheet Pile Walls
- Stability Design for Cantilever Walls
- Ultimate Resistance of Tiebacks
- OSHA Regulations for Excavations

(J) Slope Stability
- Modes of Slope Failure
- Causes of Slope Failure
- Total versus Effective Stress Analysis
- Stability of Infinite Slopes (No Seepage)
- Stability of Infinite Slopes (with Seepage)
- Stability of Finite Slopes
  - Generalized Method of Slices
- Stability of Finite Slope in Clay (Taylor)
- Slope Stabilization Methods
- Recommended Safety Factors
- Slope Protection

(K) Seismic Topics in Geotechnical Engineering
- Seismic Stress Waves
- Liquefaction
  - Shear Stress in Soil Due to Ground Acceleration
- Bearing Capacity under Dynamic Loading
- Cyclic Stress Ratio
- Glossary of Earthquake Related Terms.

) Earthwork
- General
- Computation of Earthwork Volumes
- Shrinkage and Bulking
  - Shrinkage
  - Bulking
  - Using the Mass Diagram

Reference Textbook

1- ALL-IN-ONE Civil Engineering P.E. Breadth and Depth-Exam Guide. INDRANIL GOSWAMI
2- Foundation Design and Construction, M J Tomlinson
3- Soil Mechanics, R F Craig
4- Fundamentals of Engineering Review Books
5- Foundation Engineering by Joseph E. Bowles
1. Basic Electricity
   (i) D.C circuit
   (ii) Alternating (sinusoidal) Voltage and Current
   (iii) Single Phase A.C Circuit
   (iv) Phaser Algebra and A.C Circuit
   (v) Resonance in R-L-C Circuit

2. Three-phase Circuits and System
   (i) Three-phase voltage generation
   (ii) Phaser diagram
   (iii) Y-V connection
   (iv) Balanced Three-phase Loads
   (v) Active, Reactive and Apparent Power
   (vi) Power Measurements
   (vii) Power Factor Correction

3. Magnetism and Magnetic Circuits
   (i) Magnetic Field
   (ii) Magnetic Materials and Magnetization curves
   (iii) Magnetic Equivalent Circuit
   (iv) Sinusiodal Excitation
   (v) Magnetic losses

4. A.C/D.C Machines
   (i) D.C Machines: operating principle, voltage and torque equations
   (ii) Three-phase Induction motors; operating principle, equivalent Circuit, torque-speed Characteristics, losses and efficiency.
5. **Transformers**
   (i) Ideal Transformer
   (ii) Equivalent circuit
   (iii) Phasor Diagrams
   (iv) Determination of Parameters
   (v) Performance Evaluation
   (vi) Auto-transformers
   (vii) Three-phase Transformers

6. **Active Power and Frequency Control**
   (i) Governor Control Systems
   (ii) Transmission Losses, penalty factors and loss coefficients
   (iii) Automatic Generation Control
   (iv) Active power Control Devices

7. **Reactive Power and Frequency Control**
   (i) Production and Absorption of Reactive Power
   (ii) Methods of Voltage Control
   (iii) Reactive Power and Voltage Control Devices
   (iv) Application to Transmission and Distribution systems

8. **Electric Power Distribution Systems**
   (i) Distribution System Configuration
   (ii) Primary and Secondary Distribution
   (iii) Ring, Radial and Inner-connected Systems
   (iv) Distribution Substation Layout
   (v) Planning Criteria and Network Design
   (vi) Fault Diagnosis and Restoration of Supply
9. Building Services Engineering
   (i) Estimation of Power Demand
   (ii) L.V Cables and Bus-way Systems
   (iii) Conductor Sizing Factors
   (iv) Circuit Protective Conductor
   (v) Earth Leakage and Touch Voltage
   (vi) Inspection and Testing
   (vii) Lightning Protection

10. General Protection Principles
    (i) Basic Protection Principles
    (ii) Instrument Transformers
    (iii) Coordination of Over-current and Earth Protection for Distribution Systems
    (iv) Pilot-wire Differential Protection of Feeder
1. Electrical Power Supply
   (i) Generation, Transmission, and Distribution
   (ii) Application of Electricity
   (iii) Solar Photo-voltaic Systems
   (iv) Design of Electrical Installations
   (v) Load Estimation
   (vi) Power Factor correction
   (vii) Power Quality and Power system harmonics
   (viii) Consumer and Substation, Switchboards and Switchgear
   (ix) Maintenance of Electrical Equipment, Switchgear and Cables
   (x) Design of Energy Efficiency and Sustainability

2. Lighting Requirement for Workplace, Indoor, and Outdoor
   (i) Visual Needs for Safety and Security
   (ii) Determine the Lighting Requirements for Indoor and Outdoor Workplaces

3. Energy Efficiency Requirement
   (i) Minimum Energy-Efficiency Requirements for New Installation and Replacement of Systems and Equipment in Buildings
   (ii) Replacement of Components of Systems and Equipment in Buildings

4. Protection for Safety
   (i) Principle of Operation of Protective Devices
   (ii) Maximum Demand and Diversity Factors
(iii) Protection Against Over-current and Short Circuits
(iv) Protective Devices and Circuit Conductors
(v) Discrimination in Protection of Electrical Circuits

5. Cables, Bus-ways and Distribution Boards

(i) Type and Characteristic of Cables
(ii) Method of Installation
(iii) Sizing of Conduit and Trunking
(iv) Factors Affecting the current Carrying Capacities of Cables
(v) Sizing of Cables and Bus-ways for use Under Different Types of Conditions
(vi) Connected Load, Maximum Demand and Circuit Breakers Ratings

For a Electrical Distribution Board

6. Earthing

(i) Purpose of Earthing
(ii) Methods of Earthing
(iii) Earth Fault Loop Impedance and Earth Fault Current
(iv) Suitable Sizes of Circuit Protective Conductor
(v) Testing of Earthing

7. Emergency Lighting

(i) Exit and Emergency Lighting Requirements for Evaluation of Occupants
(ii) Types of Back-up Power Supply
(iii) Exit and Directional Signs

8. Standby Power Generator System

(i) Types of Essential and Critical Loads
(ii) Sizing of Generator
(iii) Voltage Regulation and its Effects on Generator Sizing
(iv) Protection of Alternator and Prime movers
(v) Installation of Standby Generator System Including Day-tank, Battery and charger, Full supply, Engine cooling system, plant room ventilation, exhaust and fresh air intake, contend instrumentation plant and automatic transfer switch

9. Automatic Fire Alarm System
(i) Requirement for automatic and manual fire detection system and purpose of compartmentation as required by the fire code
(ii) Interaction with other building services such as emergency voice communication system, lifts, AHU, pressurization fans and auto-doors during alarm activation

10. Emergency Voice Communication System
(i) Requirements for public address system for building above 24 meters but less than 60 meters.
(ii) Requirements for emergency voice communication for building above 60 meters
(iii) Requirements for fireman intercom

11. Inspection, Testing, and Common Violation in Electrical Installation
(i) Mandatory requirements for inspection and testing of electrical prior to energisation of electrical supply
(ii) Types of test instruments and standard methods of testing

12. Measuring Instruments
(i) Principle of operation of Electrical Measuring Instruments
(ii) Essential of Indicating Instruments
(iii) Types of Instruments
(iv) Errors Common to All Types of Instruments
(v) Moving Iron Instruments
(vi) Moving Coil Instruments
(vii) Comparison Between Moving Iron and Moving Coil Instruments
(viii) Comparison Between Moving Iron and Dynamometer Type Instruments
(ix) Extension of Instrument Range
(x) Measurement of power
(xi) Wattmeter, Dynamometer Type Wattmeter
(xii) Energy Meter, Multimeter or AVO meter, Electronic Multimeter,
(xiii) Digital Multimeter

13. **Electrical Engineering Codes/Standards**

(i) Codes, standards and Regulations

(ii) Codes and standards for building services.

**REFERENCES**

1. Basic Electrical & Electronics engineering by J.B GUPTA
2. Electrical Installation Calculations (advanced) by A.J Watkins Charis Kitcher
3. Practice of professional engineering Examination 2012 (Professional Engineering Board Singapore)
4. Code of Practice for “Protection against Lightning” Singapore Standard SS555
5. Code of Practice for Electrical Installations CP 5 Singapore Standard
6. IEC Regulation, Electrical Building Services
7. IEE Wiring Regulations
SCOPE (Electronic PE)

I. General Electrical Engineering Knowledge
   A. Circuit Components
      1. Passive Components
      2. DC Circuits
      3. Sinusoidal analysis
      4. Transient analysis
      5. Power and energy calculations
   B. Measurement and Instrumentation
      1. Transducer and System Characteristics
      2. Operational Amplifier
   C. Signal Processing
      1. Sampling Theory
      2. Analog-to-digital (A/D) and digital-to-analog (D/A) Conversions

II. Digital Systems
   A. Digital Logic
      1. Boolean algebra
      2. Combinational and sequential logic
   B. Digital Components
      1. Digital devices
      2. Memory devices
      3. Programmable logic devices
      4. Microcontrollers / embedded systems

III. Electric and Magnetic Field Theory and Applications
   A. Electromagnetic Fields
      1. Theory
      2. EMI / EMC
   B. Transmission Lines and Guided Waves
      1. Transmission lines, balanced and unbalanced
      2. Waveguides
   C. Antennas
      1. Gain, patterns, and polarization
      2. Impedance
IV. Electronics
A. Electronic Circuit Theory
1. Small-signal and large-signal models
2. Active networks and filters
3. Nonlinear circuits (e.g., comparators)
4. Sinusoidal steady-state analysis
5. Transient analysis
6. Power and energy calculations
B. Electronic Components and Circuits
1. Solid-state power devices and power electronics applications
2. Battery characteristics and ratings
3. Power supplies
4. Oscillators and phase-locked loop characteristics
5. Amplifiers
6. Modulators and demodulators
7. Diodes
8. Circuit protection and safety
9. Transistors and applications

V. Control System Fundamentals
A. Block diagrams
B. Characteristic equations
C. Frequency response
D. Time response
E. Control system design and implematation (e.g., compensators, steady-state error)
F. Stability (e.g., tests, Bode plots, root locus, transport delay)

VII. Communications
A. Modulation
1. Analog modulation
2. Digital modulation
3. Spread spectrum modulation characteristics
B. Noise and Interference
1. Signal-to-noise ratio
2. Quantization noise
3. Noise figure and temperature
4. Interference
5. Coding, error detection and correction
C. Telecommunications
1. Wireline communications
2. Wireless communications
3. Optical communications
4. Multiplexing
5. Traffic and switching

VIII. Programming
1. Overview of Computer and Computer System
2. C and C++ fundamentals
3. Branching
4. Looping
5. Files
6. Functions
7. Pointers, Arrays and Strings

IX. Microprocessor System
1. Introduction to Microprocessor System
2. Architecture of the 8088/8086 Microprocessor
3. Addressing Modes
4. Assembly Language Programming
5. The architecture of Intel microprocessor families

X. Computer Architecture and Engineering
1. Classic components of a computer
2. Measuring Performance
3. Major factors for performance of a computer
4. MIPS assembly Language Programming
REFERENCES

1. Electronic Devices by FLOYD
2. Electronic Devices and Circuits by BOGART
3. Electronic Communications (Modulation and Transmission) by ROBERT J. SCHOENBECK
4. Digital Fundamentals by THOMAS L. FLOYD
5. Engineering Circuit Analysis
6. Computer Organization and Design by DAVID A. TATTERSON and JOHN L. HENNESSY
7. Electromagnetic Fields
8. Transmission Lines and Guided Waves
9. Antennas
10. Electronic Communication Techniques by YOUNG (or) other authors
11. Principles of Communication Systems
12. Analog Electronics
13. Advanced Electronic Communication Systems
14. Optical Communications
15. Radar Communications
16. Satellite Communications
17. Wireless Communication Systems
18. Electronic Communication Systems
19. Electronic Control System
20. Modeling and Control
21. Radio Wave Propagation
22. RF and Microwave
23. Modern Control System
24. The 8088 and 8086 Microprocessors: Programming, Interfacing, Software, Hardware, and Application by Walter A. Triebel, Avatar Singh
SCOPE (Water Resources PE)

I. Fundamental of Engineering - Refer to Fundamentals of Engineering
   Supplied - Reference Handbook, Seventh Edition

II. Knowledge on Engineering Theories
    (A) Hydraulics
        (1) Hydraulics and Fluid Mechanics
        (2) Open Channel Flow
        (3) Pipe Flow
        (4) Design and construction of Hydraulic structures
    (B) Hydrology
        (1) Meteorology
        (2) Surface flow
        (3) Groundwater flow
        (4) Erosion and Sedimentation
    (C) Geotechnical
        (1) Soil Mechanics
        (2) Engineering Geology
        (3) Foundation
    (D) Water Management
        (1) Soil Science
        (2) Crop Water Requirement
    (E) Environment
        (1) Watershed Management
        (2) Water quality
        (3) EIA, SIA, EMP
        (4) Basin Management
    (F) Engineering Economy
        (1) Estimating Quantity and cost
        (2) EIRR, FIRR

III. Knowledge on Professional Practice
    (A) Investigation
        (1) Surveying
        (2) Hydrology
        (3) Geology
        (4) Soil
(B) Design  
  (1) Design Criteria and Practice  
(C) Construction  
  (1) Construction Management  
(D) Quality control and Quality Assuring  
  (1) Field investigation  
  (2) Laboratory experience  
(E) Operation and Maintenance  
  (1) Rules and Regulation  

IV. Codes, Laws, Bylaws, Regulation, Acts  
(1) Water Resources and River conservation Law  
(2) Environmental law  
(3) Land Revenue and Fishery Law  
(4) Canal and Embankment Act
SCOPE (Water Supply and Sanitation PE)

I. Water Supply
   (A) Water Treatment
      1. Water Quality
      2. Treatment Process
      3. Treated water quality
   (B) Water Supply
      1. Source
      2. Population
      3. Water demand
      4. Water distribution system
      5. Pipe, Fitting and machinery specifications
   (C) Plumbing Works
      1. Storage
      2. Loading unit & design flow
      3. Hot water supply system
      4. Cold water supply system
      5. Prevention of recontamination
   (D) Sanitation
      1. Building sewer / drainage system
      2. Collection system
      3. Quantity and quality of waste water
      4. Treatment system both on site & off site
      5. Effluent quality
      6. Disposal
   (E) Rain Water
      1. Run off quantity
      2. Drainage system

II. Code, Standard & Specification for construction installation of w/s works

III. Code, Standard & Specification for maintenance of w/s works

IV. Ethics
SCOPE (Civil Bridge PE)

1. Investigation of Bridges and Culverts
2. Investigations for Important Bridges
3. Design Flood Discharge for Bridges
4. Linear Waterway of Bridges
5. Choice of Foundations for Piers and Abutments
6. Types Bridges and Loading Standards
7. Setting Out for Piers and Abutments
8. Open Foundation
9. Pile Foundation
10. Well Foundation
11. Well Foundation - Case Studies
12. Piers and Abutments
13. Superstructure - Design Aspects
14. Superstructure - Construction
15. Inspection of Bridges
16. Maintenance of Bridges - Substructures
17. Maintenance of Superstructure - Girders
18. Rebuilding of Bridges
19. Construction Management
20. Grade Separators
21. River Training and Protection Works

(Civil Bridge PE)

REFERENCES

1. Bridge Engineering (Second Edition) by S. Ponnuswamy
2. AASHTO Specifications for Highway Bridges
## Core Engineering Competencies

### A. Apply engineering knowledge, methods and techniques

**Definition**

Solves engineering problems using appropriate theoretical and practical engineering principles.

**Indicators**

- Defines potential issues or opportunities.
- Collects and analyses relevant data.
- Identifies alternate solutions based on feasibility, technology and economic assessments.
- Develops solutions that achieve system requirements and specifications.
- Selects and applies appropriate testing methodologies and techniques to verify that solutions meet specifications, codes and standards.
- Implements engineering solutions.
- Evaluates effectiveness of engineering solutions (i.e., practicality, constructability).

*Note: This competency is about assessing an applicant's ability to solve engineering problems (by identifying alternate solutions).*

### B. Use engineering technology, tools and equipment

**Definition**

Uses appropriate technology and engineering tools based on sound understanding of engineering principles.

**Indicators**

- Selects relevant technology for solutions to engineering problems.
- Uses, or monitors the use of, technology to solve engineering problems.
- Verifies the reliability of the use of technology, tool or equipment.
- Verifies the effectiveness of the use of technology, tool or equipment.
- Evaluates the limitations of the technology and how it can be applied.
- Understands the underlying principles behind the technology and its application.

*Note: This competency addresses both the "hands-on" aspect of engineering and demonstration of field experience, as well as the importance of using up-to-date technology, tools and equipment.*

### C. Safeguard public safety

**Definition**

Practises engineering activities holding paramount the safety, health and welfare of the public; the protection of the environment; and the safeguarding of economic interests.

**Indicators**

- Adheres to legislations, regulations and policies within all jurisdictional levels.
- Complies with all applicable codes and standards.
- Assesses risk and safety concerns of engineering activities to identify hazards and potential harm.
- Implements practices to protect health and safety of the public.

*Note: Reference to the public in this competency includes one self and colleagues.*
D. Recognize the impacts of engineering on the environment, economy and society

**Definition**
Develops engineering solutions that are based on a sound understanding of their impacts on the environment, economy and society.

**Indicators**
- Identifies the types of assessments and consultations required.
- Assesses, to the extent possible, long term environmental and sustainability issues associated with engineering activities.
- Assesses, to the extent possible, the economic and social impacts of engineering.
- Recommends engineering solutions that consider assessment findings.

Note: The word "develops" is used to highlight the fact that solutions may be proposed, but not implemented. This competency addresses the professional engineer's responsibility to consider the social implications of engineering activities.

E. Manage engineering activities

**Definition**
Applies the principles of sound management when conducting engineering activities including individual work.

**Indicators**
- Conducts activities with an accurate understanding of expectations and needs.
- Develops or implements schedules or budgets.
- Manages the interplay of schedule, resources, quality and budget.
- Manages risks.
- Measures outcomes.

Note: This competency addresses the importance of proper work management practices for projects or for individual undertakings.

F. Communicate engineering information

**Definition**
Effectively communicates engineering information verbally, graphically and in writing.

**Indicators**
- Tailors communications to the audience and clarifies complex and technical information.
- Presents information clearly and concisely.
- Verifies audience's understanding.
- Listens actively and confirms own understanding.
- Prepares correspondence, reports, records, or drawings.
- Keeps clear and comprehensive records of engineering decisions, and supporting documentation (e.g. design record).

Note: This competency goes beyond language skills to address two-way communication. Applicants who do not communicate verbally due to a disability would demonstrate "verbal" communication through another interactive form of communication (i.e. sign, voice output communication aids, etc.)
### A. Work Collaboratively

**Definition**
Works effectively to achieve societal, organizational and project goals in a collaborative manner.

**Indicators**
- Shares relevant information, key knowledge and expertise with others.
- Respects contributions of other professionals and colleagues at all levels.
- Offers assistance to others when needed.
- Resolves difficult interpersonal situations using tact and honesty.
- Handles disagreement promptly, seeking mutually agreeable solutions.
- Demonstrates sensitivity, and respect in interactions with diverse individuals and groups in ways that advance the achievement of team or organizational goals.

*Note: The competency addresses the ability to work with diverse groups, demonstrating the respect and professionalism necessary to succeed.*

### H. Maintain and Enhance Engineering Skills and Knowledge

**Definition**
Takes actions to maintain and enhance proficiency in the practice of engineering activities.

**Indicators**
- Addresses inadequacies in knowledge and skills through further study and consultation with others.
- Engages in continuous learning activities (e.g., professional readings, courses, self-study, receiving coaching or mentoring, experiential learning).
- Integrates general knowledge of current events and issues to one's own engineering practice.
- Keeps current with the dynamic nature of engineering (including advances in knowledge and technological advancements).
- Conducts self-assessment.
- Develops learning plan.

*Note: This competency addresses the importance of keeping skills up-to-date, keeping current with the dynamic nature of engineering, and addressing any gaps through continuous learning.*
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<tr>
<th>No.</th>
<th>Description</th>
<th>Maximum Marks</th>
<th>Remarks of Assessor</th>
<th>Marks Attained</th>
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<tr>
<td>1</td>
<td>Knowledge on Fundamentals of Engineering</td>
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<td>2</td>
<td>Knowledge on Engineering Theories</td>
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<td>Knowledge on Rules and Regulations</td>
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<td>Knowledge on Standards and Specifications</td>
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<td>5</td>
<td>Experience</td>
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<td>6</td>
<td>Knowledge on Professional Practices</td>
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<td>7</td>
<td>Experience on his or her Profession</td>
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<td>Competence in his or her Profession</td>
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<td>Safety and Ethics</td>
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<td>Knowledge on Safety</td>
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<td>Knowledge and awareness on Ethics</td>
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<td>12</td>
<td>Skills</td>
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<td>Management Skill and knowledge</td>
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<td>14</td>
<td>Communication Skill and Presentation</td>
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<td>15</td>
<td>Computer Skill, Software knowledge</td>
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<td>16</td>
<td>Others</td>
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<td>17</td>
<td>Quality of Technical Report</td>
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<td>18</td>
<td>Is he or she practicing?</td>
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**Note**

(a) Does he or she need to study more (Decision)

(b) Does he or she need to get more experiences (Decision)

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Signature of Assessor: .................................................................

Name of Assessor: .................................................................

Date: .................................................................